REMARKS

Claims 1-47 are pending in this application. Claims 1, 2, 3, 4, 12, 17, 25, 33, 38, 46, and 47 are independent.

Allowable Subject Matter

Applicant wishes to thank the Examiner for indicating that claims 25-45 are allowed.

Claim Rejection - 35 USC 103; Sasaki

Claims 1-3 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,965,852 (Sasaki). Applicant respectfully traverses this rejection.

Claim 1

Claim 1, in a preferred embodiment, is directed to a millimeter wave band transmitter (e.g., Fig. 1A) comprising a frequency arranging circuit (e.g., frequency arranging circuit 1) coupling a plurality of input modulation signal waves (e.g., "satellite broadcasting signal wave" at terminal 21 and UHF band signal at terminal 4 combined at signal combiner 9) while frequency-converting at least one of said plurality of input modulation signal waves (e.g., frequency mixer 6) from a frequency

position lower than a frequency position of at least one other of said plurality of input modulation signal waves to a frequency position adjacent to and higher than the frequency position of the at least one other of said plurality of input modulation signal waves along a frequency axis (e.g., see Fig. 2B) in order to generate a multiplex signal wave having respective frequency bands of said plurality of input modulation signal waves arranged on the frequency axis independent of each other, a frequency up-converter (e.g., frequency up-converter 2) up-converting said multiplex signal wave to a millimeter wave band to generate a millimeter wave band multiplex signal wave, and a transmission circuit (e.g., amplifier 14 and transmission antenna 3) transmitting said millimeter wave band multiplex signal wave.

Applicant submits that Sasaki fails to teach at least the claimed frequency arranging circuit.

The Office Action states that Sasaki's multiplexer 78 teaches the claimed frequency arranging circuit.

Sasaki discloses a communications network system that provides reliability through a heterodyne type transmitter-receiver that includes a plurality of intermediate portions each having variable frequency capability (Summary of the Invention). The heterodyne type transmitter-receiver can increase the number of communication channels by multiplexing additional intermediate frequency portions using a multiplexer (H1, 78). (see Abstract, Background of the

Invention, and Fig. 6). The multiplexer multiplexes signals from a plurality of heterodyne transmitter-receivers.

Sasaki's intermediate portions have variable frequency oscillators, thus enabling needed channels to be transmitted even in the case of line failure. In the event of a line failure, the intermediate frequency portion effected by the line failure changes its frequency by changing the frequency of the variable frequency local oscillator.

In Sasaki, generated frequency bands are pre-defined by the communications network. Sasaki's communications network (Fig. 1) includes lines connecting nodes, where each line is of a different frequency. In order to transmit over a different line, the transmission is changed to the frequency of the different line. The change in frequency is accomplished by changing a frequency of the local oscillator in the intermediate frequency portion of a transmission node. Thus, because of the pre-defined frequency for each line, Sasaki does not address a problem with overlapping frequency bands.

In order to clarify differences between the claimed frequency arranging circuit and the teachings of Sasaki, claim 1 has been amended to recite that the "arranging" function of the claimed invention moves at least one frequency band relative to at least one other frequency band, such that the at least one frequency band is frequency converted from a frequency position

lower than the at least one other frequency band to a frequency position adjacent to and higher than the at least one other frequency band along a frequency axis to be independent of each other.

A problem with a known conventional configuration such as that shown in present Fig. 14, has been that there may be an overlap of frequency components, resulting in that the signal cannot be sufficiently multiplexed. (present specification at page 3, lines 10 to 28). In the conventional communication apparatus, a plurality of data signals input to a plurality of communication circuits via a plurality of terminals are converted into signals of the UHF band and added together by an adder 211. The multiplexed signals are up-converted into a modulation signal wave of the millimeter wave band to be transmitted as a millimeter wave. However, any overlapping signals cannot be multiplexed.

On the other hand, the preferred transmitter of the present invention adjusts frequency of input signals such that frequency bands of broadcasting signals do not overlap. The preferred transmitter prevents overlap between frequency bands by re-positioning at least one of the signals to a known non-overlapping frequency adjacent to and above another signal.

Claim 2

Claim 2, in a preferred embodiment, is directed to a millimeter wave band receiver (e.g., Fig. 2) comprising a reception circuit (e.g., antenna 31, amplifier 34) receiving a millimeter wave band multiplex signal wave, said millimeter wave band multiplex signal wave generated by coupling a plurality of modulation signal waves while frequency-converting at least one of said plurality of modulation signal waves from a frequency position lower than a frequency position of at least one other of said plurality of modulation signal waves to a frequency position which is adjacent to and higher than that of the modulation signal wave along a frequency axis, and having respective frequency bands of said plurality of modulation signal waves arranged on the frequency axis independent of each other, a frequency down-converter (e.g., frequency down-converter 32) down-converting said millimeter wave band multiplex signal wave from a millimeter wave band to generate a multiplex signal wave, and a frequency rearranging circuit (e.g., frequency rearranging circuit 33) dividing said multiplex signal wave (e.g., distributor 39) while frequency-converting (e.g., mixer 42) said at least one modulation signal wave from the frequency position higher than the frequency position of the at least one other of said plurality of modulation signal waves to the frequency position lower than the frequency position

of the at least one other of said plurality of modulation signal waves along the frequency axis in order to restore said plurality of modulation signal waves respectively having the former frequency bands (e.g., terrestrial broadcasting signal of the intermediate frequency band is converted into a terrestrial broadcasting signal of the UHF band; page 17, lines 10-19).

Applicant submits that Sasaki fails to teach at least the claimed frequency rearranging circuit.

The Office Action states that Sasaki's receiver portion shown in Fig. 6 teaches the claimed frequency rearranging circuit.

Sasaki's receiver portion converts a received intermediate frequency signal back to its originating signal frequency. On the other hand, the preferred frequency arranging circuit of the present invention reverses the position arrangement provided in the transmitted signal such that at least one modulation signal wave is converted from the frequency position higher than the frequency position of the at least one other of said plurality of modulation signal waves to the frequency position lower than the frequency position of the at least one other of said plurality of modulation signal waves along the frequency axis in order to restore said plurality of modulation signal waves to their respective positions along the frequency axis.

Claim 3

Claim 3, in a preferred embodiment, is directed to a millimeter wave band communication apparatus comprising a millimeter wave band transmitter and a millimeter wave band receiver. For the reasons above for claims 1 and 2, Applicant submits that Sasaki fails to teach at least the claimed frequency arranging circuit and frequency rearranging circuit.

Accordingly, Applicant respectfully requests that the rejection be withdrawn.

Claim Rejection - 35 USC 103; Sasaki, Roder

Claims 4, 5, 8-18, 21-24, 46, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of U.S. Patent No. 2,233,183 (Roder). Applicant respectfully traverses this rejection.

Claim 4

Claim 4, in a preferred embodiment, is directed to a millimeter wave band transmitter (e.g., Fig. 1A) comprising a first input terminal of a first modulation signal wave (e.g., input terminal 4 receiving "terrestrial broadcasting signal"), a second input terminal of a second modulation signal wave (e.g., input terminal 21 receiving "satellite broadcasting signal"), a first

local oscillator generating a first local oscillation signal of a first local oscillation frequency (e.g., local oscillator 5), a first frequency mixer (e.g., mixer 6) mixing said first modulation signal wave with said first local oscillation signal to frequency-convert said first modulation signal wave from a frequency position lower than a frequency position of said second modulation signal wave to a frequency position adjacent to and higher than a frequency position of said second modulation signal wave along a frequency axis (e.g., see Figs. 2A and 2B), a signal combiner coupling said frequency-converted first modulation signal wave with said second modulation signal wave to generate a multiplex signal wave (e.g., signal combiner 9; Fig. 2B), a second local oscillator generating a second local oscillation signal of a second local oscillation frequency (e.g., local oscillator 11), a second frequency mixer (e.g., mixer 12) mixing said multiplex signal wave with said second local oscillation signal to up-convert said multiplex signal wave to the millimeter wave band to generate a millimeter wave band multiplex signal wave, and a transmission circuit transmitting said millimeter wave band multiplex signal wave (e.g., antenna 3).

The Office Action states that Sasaki teaches the claimed invention except that one of the plurality of input modulation signals without frequency conversion is combined with other up-converted signals to form a multiplex signal. The Office Action

further states that Roder discloses a frequency modulation system wherein one of the plurality of input modulation signals without frequency conversion is combined with other up-converted signals to form a multiplex signal (referring to signal No. 1 in Fig. 3).

Roder

It is noted that Roder discloses that mixers 39 and 44 serve to down-convert subcarrier signals (page 2, 1st col., lns. 29-34, 40-43). The Office Action implies that Roder discloses that the mixers up-convert in a statement indicating that a multiplex signal is formed from up-converted signals.

Roder discloses a frequency modulation system that forms a specific relationship between frequencies of subcarrier waves and the shift in frequency of the main carrier (1st col., lns. 25-30) in order to transmit two or more signals as a single modulated main carrier wave. The carrier wave is frequency modulated by modulated subcarrier signals. Modulated subcarrier signals are supplied to a common circuit (e.g., 10) and each modulated circuit is supplied to a frequency modulator for the carrier wave. (see Fig. 3, which shows three subcarrier channels 1, 2, and 3 which modulate the signal from oscillator 1).

The frequency emitted by the system is additive as can be seen by equation (1). Each subcarrier contributes in a progressive relationship to a specific amount of reduction in the final

frequency output. The resulting reduction in the carrier wave accurately characterizes the subcarrier signals being transmitted.

Differences over Roder and Sasaki

From the statements in the Office Action, it appears that Roder is relied on for teaching the claimed second input terminal of a second modulation signal wave. In particular, the Office Action states that, "Roder discloses a frequency modulation system wherein one of the plurality of input modulation signals without frequency conversion is combined with other up-converted signals to form a multiplex signal."

Sasaki teaches transmission of pre-determined signal frequencies. Roder is relied on for teaching that one of the pre-determined signal frequencies could be unmodulated. In order to clarify the differences of the claimed first frequency mixer and the transmission of pre-determined signal frequencies of Sasaki combined with Roder, claim 4 has been amended to clarify the claimed first frequency mixer.

Applicant submits that Sasaki and Roder, either alone or in combination, fail to teach at least the claimed first frequency mixer that converts the first modulation signal wave from a frequency position lower than a frequency position of said second modulation signal wave to a frequency position adjacent to and higher than a frequency position of said second modulation signal

wave along a frequency axis in order to prevent overlap and enable multiplexing of the signal waves.

Claim 12

Claim 12, in a preferred embodiment, is directed to a millimeter wave band receiver (e.g., Fig. 2) comprising

a reception circuit (e.g., antenna 31) receiving a transmitted millimeter wave band multiplex signal wave that is a multiplex signal wave up-converted to a millimeter wave band by a second local oscillation frequency, said multiplex signal wave generated by coupling first and second modulation signal waves after said first modulation signal wave is frequency-converted from a frequency position lower than a frequency position of said second modulation signal wave to a frequency position which is adjacent to and higher than said second modulation signal wave along a frequency axis by a first local oscillation frequency (e.g., Fig. 1A),

a first local oscillator generating a first local oscillation signal of said second local oscillation frequency (e.g., local oscillator 36),

a first frequency mixer (e.g., mixer 37) mixing said millimeter wave band multiplex signal wave with said first local oscillation signal to down-convert said millimeter wave band multiplex signal wave from the millimeter wave band to generate said multiplex signal wave,

a signal distributor (e.g., distributor 39) dividing said down-converted multiplex signal wave into said frequency-converted first modulation signal wave, and said second modulation signal wave,

a second local oscillator (e.g., local oscillator 41) generating a second local oscillation signal of said first local oscillation frequency,

a second frequency mixer (e.g., mixer 42) mixing said frequency-converted first modulation signal wave with said second local oscillation signal to frequency-convert again said first modulation signal wave from the frequency position higher than the frequency position of said second modulation signal wave to the frequency position lower than the frequency position of said second modulation signal wave along the frequency axis in order to restore said first modulation signal wave,

a first output terminal providing said restored first modulation signal wave (e.g., terminal 44), and

a second output terminal providing said second modulation signal wave supplied from said signal distributor (e.g., terminal 51).

The claimed second frequency mixer is for reversing the position arrangement provided in the transmitted signal such that said first modulation signal wave is frequency-converted from the frequency position higher than the frequency position of said

second modulation signal wave to the frequency position lower than the frequency position of said second modulation signal wave along the frequency axis in order to restore said first modulation signal wave. Sasaki and Roder, either alone or in combination, fail to teach conversion of signal wave from a frequency position higher than a second signal wave to a frequency position lower than the second signal wave.

Accordingly, Applicant submits that Sasaki and Roder fail to teach at least the claimed second frequency mixer.

Claim 17

Claim 17, in a preferred embodiment, is directed to a millimeter wave band communication apparatus comprising a millimeter wave band transmitter, as in claim 4, and a millimeter wave band receiver, as in claim 12. For the reasons above for claims 4 and 12, Applicant submits that Sasaki and Roder, either alone or together, fail to teach at least the claimed first frequency mixer of the millimeter wave band transmitter and fourth frequency mixer of the millimeter wave band receiver.

Claims 46 and 47

Claims 46 and 47 are directed to a millimeter wave band receiver. Claim 46 recites a frequency rearranging circuit dividing said multiplex signal wave while frequency-converting said at least

one modulation signal wave and maintaining the frequency band of at least one other modulation signal wave to restore said plurality of modulation signal waves to respective original broadcasted frequency bands. Similar to claim 12, at least one of a plurality of modulation signal waves had been converted from a frequency position lower than a frequency position of at least one other of the plurality of modulation signal waves to a frequency position which is adjacent to and higher than the at least one other of the plurality of modulation signal waves along a frequency axis. Thus, in restoring the modulation signal waves, the converted signal wave is reconverted back to a position lower than the at least one other modulation signal wave.

Thus, the same argument as in the above for claim 12 applies to claim 46. Claim 47 recites the same feature. The argument as in the above for claim 12 applies as well to claim 47.

Accordingly, Applicant respectfully requests that the rejection be withdrawn.

Claim Rejection - 35 USC 103; Sasaki, Roder, Kiyanagi

Claims 6, 7, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki, Roder, and further in view of U.S. Patent No. 6,185,201 (Kiyanagi et al.). Applicant respectfully traverses this rejection.

Claim 6, and similarly claim 19, in a preferred embodiment, is directed to a further limitation that the first local oscillation frequency is set so that said lower side band signal of said up-converted first modulation signal wave is arranged adjacent a higher frequency side of said second modulation signal wave.

The Office Action relies on Figure 24 of Kiyanagi for teaching this claimed limitation.

Kiyanagi's Fig. 24 pertains to a conventional method of communication between a pair of multiplex radio repeaters and is described in the "Background of the Invention" section. With respect to the potential for overlap between frequency channels, Kiyanagi states that,

> "to prevent spurious radiation, the transmitter must eliminate the local frequency signals so as to prevent these signals from being emitted over the group of radio frequency channels, through use of a filter having a narrow bandwidth." (column 2, lines 56-60).

Kiyanagi further discloses that such a method requires a band-pass filter having band-pass characteristics corresponding to each of the channels handled by the multiplex radio transceiver (column 3, lines 14-20). Thus, it can be seen that, at least with respect to Figure 24, Kiyanagi teaches filtering out local frequency bands generated by local oscillators.

An improved arrangement disclosed in Kiyanagi involves the use of only one band-pass filter ("Summary of the Invention"). In

particular, the improved arrangement works by selection of an optimum value for a intermediate frequency of a transmitter and an intermediate frequency of a receiver enabling a group of transmission radio frequency signals and a group of local frequency signals to be allocated without overlap (Abstract). For example, Kiyanagi teaches selection of an optimum value for a second intermediate frequency of a transmitter and a third intermediate frequency of a receiver (e.g., see column 18, lines 9-40, 48-51, as well as the example shown in Fig. 4). Thus, Kiyanagi teaches prevention of overlap through optimal choice of frequencies transmitted and received.

Kiyanagi does not appear to teach changing the arrangement of, for example, the local frequency group relative to the RF signal group. In other words, Kiyanagi also does not teach the claimed first frequency mixer of claim 4. Thus, Kiyanagi fails to make up for the deficiency of Sasaki and Roder, as in the above for claims 4 or 17. The same argument applies as well to claims 7 and 20.

Applicant respectfully requests that the rejection be withdrawn.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222) at the

telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By ______________________
Terrell C. Birch, #19,382

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

RWD
TCB/RWD/fjl
0033-0662P

Attachment(s):